# EXPERIMENTS WITH OATS.

COMPARISON OF VARIETIES. PREPARATION OF THE SEED BED. QUANTITY AND QUALITY OF SEED. DEPTH OF SEEDING. DRILLING VS. BROADCASTING.

# OHIO
# Agricultural Experiment Station

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BULLETIN

OF THE

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# TEN YEARS' EXPERIMENTS WITH OATS.

BY C. G. WILLIAMS.

## VARIETY AND CULTURAL TESTS.

During the past ten years various experiments have been conducted with oats, the results of which have been published in bulletins No. 57, issued in 1894, No. 67, issued in 1896, and No. 101, in 1899. In this bulletin the work will be brought down to 1903 and will cover the work carried on for the ten years preceding.

This work was conducted under the personal supervision of the late J. Fremont Hickman, former Agriculturist of the Station, whose carefully kept records have made it possible to present the report which follows. For valuable assistance in compiling these records the writer is indebted to C. A. Patton, Assistant Foreman, and Miss Bell Hickman.

This work includes experiments with upwards of ninety differently named varieties, forty-eight of which have been tested for ten consecutive years; experiments as to the preparation of seed bed; amount of seed per acre; quality of seed; depth of seeding; drilling as compared with broadcast seeding; the use of commercial fertilizers; oats grown in continuous culture, and some suggestions as to the treatment of oats to prevent smut.

## COMPARISON OF VARIETIES.

The grouping of varieties followed in previous bulletins has been continued with the 71 varieties herewith reported upon.

The "Welcome," "Widewake" and "Seizure" groups are named for the typical varieties of these groups, while a mixed group is made up of black and mixed sorts, and varieties not clearly belonging to either of the main groups.

The Welcome group has been described in Bulletin 101 as having an "open panicle, coarse straw and short, plump grain." It includes 21 of the 71 varieties.

The Wideawake group includes 23 varieties, and differs from the Welcome in shape of berry, being longer and more pointed. It also requires a slightly longer season.

The Seizure group is made up of 13 sorts, the distinguishing characteristic of which is the head growing more or less one-sided. This group requires a still longer season. It is strong in straw.

Some new varieties are added each season and these are usually placed in the mixed group until their proper classification is determined.

These varieties are grown on one-tenth acre plots and every fourth plot in each group is seeded to the variety which names the group—in the Welcome group to the Welcome variety, and so on. In the mixed group the Monarch variety is used as the standard.

In Table I is given the yield in bushels per acre of 71 varieties tested during the ten years, 1893–1902, and the ten-year average for all those varieties which have been grown ten years. Some of them have been grown only four to nine years. The varieties are arranged alphabetically, not in the order in which they were grown in the field.

In column 12 is given the average increase or decrease in yield as compared with the standard for the ten years or less. This increase or decrease is not figured on the actual yield of the fourth plot standards, but on the assumed standard for the variety in question.

For instance if

Plot 1—Welcome, yields 60 bus. per acre,
Plot 2—Am. Banner, yields 63 bus. per acre,
Plot 3—Improved Am., " 68 " " "
Plot 4—Badger Queen, " 60 " " "
Plot 5—Welcome, yields 58 bus. per acre,

it is assumed that, had plots 2, 3 and 4 been seeded to the Welcome variety, their yield would have been as follows:

Plot 1—Welcome, 60 bus. per acre,
Plot 2— " 59½ " " "
Plot 3— " 59 " " "
Plot 4— " 58½ " " "
Plot 5— " 58 " " "

and hence the increase accredited to plot 2 would be three and one-half bushels; to plot 3, nine bushels and to plot 4, one and one-half bushels.

## OATS—TABLE I.—COMPARATIVE TEST OF VARIETIES.

*Yield in bushels per acre.*

| WELCOME GROUP | 1893 | 1894 | 1895 | 1896 | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 10-year average | Increase (+) Decrease (—) | Weight per bu. Lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| American Banner | 35.15 | 39.20 | 48.90 | 63.43 | 63.12 | 38.43 | 60.78 | 52.18 | 42.18 | 73.28 | 51.66 | +4.21 | 29.15 |
| Badger Queen | 33.59 | 46.10 | 45.62 | 60.15 | 59.53 | 38.12 | 57.81 | 54.68 | 42.18 | 64.37 | 50.21 | +1.59 | 30.72 |
| Barley Oats | 28.90 | 44.50 | 48.44 | 62.03 | 58.12 | 36.87 | 57.18 | 53.12 | 42.80 | 71.56 | 50.35 | + .97 | 30.05 |
| Bonanza King | ..... | 44.50 | 48.67 | 55.31 | 69.53 | 45.62 | 60.00 | 58.75 | 42.18 | 69.06 | 54.85 | — .51 | 29.69 |
| Centennial | 28.28 | 40.00 | 54.00 | 61.25 | 70.00 | 42.50 | 56.40 | 55.46 | 44.21 | 71.56 | 52.36 | +2.64 | 30.32 |
| Colonel | 32.34 | 44.50 | 55.80 | 65.78 | 62.81 | 39.68 | 39.21 | 56.71 | 45.93 | 71.87 | 53.46 | +3.69 | 29.55 |
| Clydesdale | 27.68 | 44.50 | 61.80 | 65.00 | 62.65 | 41.87 | 56.87 | 52.34 | 37.50 | 71.87 | 52.20 | +3.21 | 28.42 |
| Danish Island | ..... | ..... | ..... | 44.06 | 70.93 | 45.15 | 64.68 | 50.15 | 31.56 | 62.50 | 52.72 | —2.32 | 27.68 |
| Early Archangel | 32.96 | 37.60 | 40.31 | 62.50 | 65.15 | 44.37 | 56.25 | 51.87 | 40.00 | 70.78 | 50.17 | —1.31 | 35.17 |
| Hargett's White | 30.15 | 37.60 | 40.78 | 43.12 | 58.43 | 34.37 | 56.87 | 44.84 | 42.81 | 67.50 | 45.65 | —3.62 | 34.17 |
| Hendersons Clydesdale | 28.28 | 40.10 | 52.81 | 55.93 | 62.18 | 38.43 | 60.78 | 54.84 | 49.37 | 70.94 | 51.33 | +1.89 | 32.90 |
| Improved American | 35.78 | 46.80 | 52.65 | 68.75 | 61.56 | 38.12 | 59.68 | 53.28 | 39.36 | 64.53 | 52.05 | +3.97 | 29.27 |
| Lincoln | 39.84 | 33.20 | 40.31 | 68.43 | 72.34 | 52.50 | 62.18 | 60.62 | 40.93 | 73.44 | 54.37 | +1.92 | 31.42 |
| Pride of America | ..... | 32.50 | 37.65 | 46.56 | 66.72 | 44.37 | 61.40 | 56.72 | 44.84 | 69.84 | 51.17 | — .96 | 31.27 |
| Race Horse | 27.65 | 26.40 | 36.60 | 61.25 | 65.62 | 46.25 | 57.18 | 48.75 | 35.15 | 69.06 | 47.39 | —4.22 | 35.27 |
| Silver Mine | ..... | ..... | ..... | ..... | ..... | 31.25 | 46.87 | 57.50 | 37.18 | 75.00 | 49.56 | —5.09 | 29.70 |
| White Belgian | 30.78 | 40.80 | 52.11 | 64.67 | 71.09 | 41.25 | 58.43 | 59.37 | 41.09 | 69.69 | 52.92 | +2.94 | 30.20 |
| White Bonanza | 37.96 | 40.80 | 43.60 | 58.43 | 70.31 | 41.87 | 58.43 | 55.46 | 40.62 | 69.37 | 51.68 | + .85 | 31.52 |
| White Wonder | 37.03 | 38.80 | 52.11 | 47.50 | 59.68 | 44.22 | 54.68 | 53.43 | 37.96 | 68.75 | 49.41 | —2.47 | 33.60 |
| White Victoria | 31.40 | 43.10 | 32.65 | 56.25 | 73.43 | 45.62 | 56.56 | 57.03 | 38.12 | 68.75 | 50.29 | —1.29 | 31.90 |
| Welcome | 26.68 | 43.00 | 56.94 | 58.68 | 62.40 | 41.42 | 54.88 | ..... | 41.49 | 67.45 | 50.33 | ..... | 29.36 |

TABLE I.—CONTINUED.

| WIDEAWAKE GROUP | 1893 | 1894 | 1895 | 1896 | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 10-year average | Increase (+) Decrease — | Weight per bu. Lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 22.73 | 50.30 | 57.34 | 54.06 | 61.09 | 47.81 | 57.65 | 50.93 | 43.12 | 55.62 | 50.07 | +1.73 | 29.80 |
| Banner | 26.09 | 43.60 | 57.34 | 57.81 | 67.50 | 50.62 | 60.31 | 48.62 | 37.50 | 47.03 | 49.64 | +1.49 | 29.51 |
| Bolton | ..... | 37.00 | 45.62 | 60.00 | 65.62 | 46.72 | 60.93 | 55.62 | 42.96 | 69.53 | 53.77 | +3.07 | 28.72 |
| Early Dakota | 29.21 | 34.50 | 44.43 | 50.00 | 62.18 | 44.37 | 47.50 | 44.53 | 39.84 | 65.47 | 46.20 | —.70 | 28.80 |
| Early Prize Cluster | 29.22 | 40.80 | 48.52 | 53.12 | 59.06 | 44.55 | 58.43 | 49.06 | 43.43 | 67.18 | 49.33 | +1.02 | 29.85 |
| Early Siberian | ..... | ..... | ..... | 38.75 | 53.59 | 44.37 | 53.75 | 39.68 | 40.15 | 65.93 | 48.03 | —2.66 | 29.28 |
| Early White Maine | 30.46 | 28.50 | 44.85 | 42.18 | 49.84 | 41.40 | 47.81 | 39.00 | 37.65 | 65.31 | 42.70 | —2.60 | 28.35 |
| Green Mountain | ..... | 33.90 | 45.93 | 67.18 | 66.25 | 48.28 | 66.25 | 53.28 | 43.59 | 62.03 | 54.07 | +2.78 | 28.83 |
| Great American | ..... | ..... | ..... | ..... | ..... | ..... | 37.50 | 47.65 | 47.03 | 68 60 | 50.19 | —1.65 | 28.94 |
| Great Northern | 30.78 | 28.90 | 36.64 | 41.71 | 51.87 | 44.06 | 44.68 | 38.25 | 34.37 | 61.26 | 41.25 | —2.62 | 28.97 |
| Hopetown | 16.73 | 29.40 | 30.07 | 46.87 | 60.00 | 44.68 | 59.22 | 55.78 | 45.46 | 65.15 | 45.34 | —2.62 | 29.40 |
| Kansas Hybrid | 38.09 | 41.10 | 46.01 | 54.53 | 63.12 | 44.68 | 62.81 | 60.78 | 49.53 | 69.84 | 53.05 | +4.74 | 30.60 |
| Nameless Beauty | ..... | ..... | 36.93 | 47.81 | 67.18 | 42.81 | 51.56 | 55.78 | 45.31 | 73.59 | 52.62 | +1.03 | 26.65 |
| New Baltic | 33.75 | 30.60 | 40.78 | 42.81 | 47.81 | 42.65 | 48.75 | 37.50 | 36.09 | 57.81 | 41.85 | —2.42 | 28.67 |
| Poland | 34.21 | 31.00 | 35.62 | 55.93 | 52.96 | 45.15 | 47.50 | 38.40 | 43.90 | 69.53 | 45.42 | —.55 | 29.55 |
| Potato Oats | 23.20 | 37.00 | 36.00 | 45.31 | 57.03 | 42.81 | 45.31 | 36.75 | 34.53 | 60.15 | 41.81 | —2.67 | 29.15 |
| Probsteier | 27.65 | 44.50 | 48.00 | 55.31 | 62.96 | 44.37 | 51.09 | 50.31 | 46.09 | 64.84 | 49.51 | +.70 | 29.22 |
| State of North Dakota | 32.03 | 39.50 | 44.37 | 48.43 | 60.78 | 40.93 | 48.75 | 52.50 | 42.65 | 66.09 | 47.60 | —.57 | 28.77 |
| Scottish Chief | 25.15 | 39.00 | 50.00 | 55.31 | 62.50 | 45.93 | 57.65 | 51.72 | 44.68 | 69.84 | 50.18 | +2.21 | 30.10 |
| White California | 21.64 | 45.90 | 57.18 | 60.93 | 69.22 | 45.47 | 57.81 | 51.72 | 40.46 | 59.68 | 51.00 | +2.73 | 30.05 |
| White Schoenen | 33.43 | 26.10 | 36.26 | 42.50 | 53.59 | 43.12 | 49.53 | 39.40 | 33.12 | 59.53 | 41.66 | —2.29 | 29.32 |
| Yankee Prolific | 43.28 | 32.30 | 31.87 | 40.62 | 58.59 | 45.00 | 47.50 | 54.37 | 41.87 | 63.90 | 45.93 | ..22 | 28.62 |
| Wideawake | 29.59 | 38.90 | 37.75 | 53.10 | 60.65 | 45.01 | 52.34 | 46.54 | 44.49 | 62.26 | 47.06 | ..... | 29.17 |

TABLE I.—CONCLUDED.

| SEIZURE GROUP | 1893 | 1894 | 1895 | 1896 | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 10-year average | Increase (+) Decrease (—) | Weight per bu. Lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Black Tartarian | 23.59 | 38.60 | 48.25 | 50.93 | 60.00 | 44.68 | 58.75 | 40.31 | 37.81 | 59.22 | 46.21 | —2.50 | |
| Dakota Gray | 22.65 | 41.80 | 50.86 | 50.00 | 63.12 | 41.09 | 57.03 | 35.62 | 38.90 | 66.87 | 46.79 | —1.15 | 28.2 |
| Excelsoir | 31.09 | 34.20 | 48.28 | 48.75 | 65.62 | 45.31 | 60.78 | 49.84 | 38.12 | 66.25 | 49.82 | +1.14 | 32.75 |
| Early Swedish | 29.68 | 49.10 | 52.65 | 52.17 | 69.53 | 42.50 | 59.06 | 54.68 | 42.50 | 72.81 | 52.46 | +5.06 | 32.57 |
| Egyptian | 31.71 | 44.80 | 56.87 | 46.56 | 60.31 | 49.06 | 56.56 | 41.87 | 40.93 | 63.43 | 49.21 | + .51 | 32.80 |
| Giant Yellow French | 18.20 | 36.90 | 59.37 | 57.81 | 67.50 | 36.56 | 56.87 | 38.12 | 34.68 | 57.50 | 46.35 | —2.36 | 28.00 |
| Heavy Weight | ..... | 39.20 | 37.19 | 56.25 | 70.31 | 38.28 | 58.43 | 44.37 | 35.93 | 69.06 | 49.89 | —1.76 | 29.22 |
| Japan | 35.46 | 49.80 | 56.40 | 44.37 | 60.62 | 42.65 | 60.93 | 45.93 | 41.56 | 66.71 | 50.44 | +2.72 | 31.97 |
| New Zealand | ..... | ..... | ..... | 60.00 | 64.68 | 46.87 | 61.56 | 41.25 | 34.53 | 63.75 | 53.23 | + .28 | 29.07 |
| Prince Edwards Island | 26.25 | 46.90 | 52.10 | 46.87 | 56.73 | 40.31 | 53.12 | 45.46 | 36.71 | 54.53 | 45.90 | —2.27 | 28.39 |
| White Swiss | 31.71 | 46.20 | 51.09 | 52.17 | 65.31 | 46.25 | 60.78 | 56.09 | 43.12 | 75.00 | 52.77 | +5.54 | 32.42 |
| Wilson's Prolific | 35.31 | 46.60 | 56.25 | 42.03 | 67.50 | 43.59 | 64.37 | 48.53 | 37.96 | 70.63 | 51.26 | +3.24 | 31.30 |
| Seizure | 15.02 | 44.50 | 59.73 | 55.31 | 66.24 | 37.99 | 54.79 | 44.19 | 35.59 | 66.15 | 47.95 | ..... | 27.79 |
| MIXED GROUP | | | | | | | | | | | | | |
| Big Four | ..... | ..... | ..... | ..... | ..... | ..... | 54.68 | 42.50 | 41.56 | 62.50 | 50.31 | +5.23 | 28.87 |
| Black Beauty | 35.62 | 34.50 | 36.71 | 40.93 | 51.25 | 44.37 | 45.78 | 39.68 | 38.75 | 57.50 | 42.50 | +.35 | 29.72 |
| Black Gotham | ..... | ..... | 38.60 | ..... | ..... | ..... | 46.25 | 38.43 | 37.42 | 82.81 | 51.23 | +3.05 | 30.00 |
| Everett's Negro Black | 34.22 | 33.30 | ..... | 44.37 | 48.12 | 41.25 | 50.62 | 38.12 | 41.25 | 65.62 | 43.54 | +1.09 | 29.80 |
| Early Ripe | ..... | ..... | ..... | ..... | ..... | ..... | 32.50 | 22.81 | 24.15 | 38.12 | 29.49 | —17.88 | 24.50 |
| Heller | ..... | ..... | 39.22 | ..... | 62.18 | 36.09 | 37.18 | 34.37 | 30.93 | ..... | 40.15 | —4.41 | 26.30 |
| Mexican Gray | ..... | ..... | ..... | 42.50 | 49.37 | 41.25 | 45.00 | 39.37 | 35.78 | 57.50 | 43.74 | — .42 | 28.90 |
| Michigan Wonder | ..... | ..... | ..... | ..... | ..... | ..... | 41.25 | 39.06 | 39.92 | 52.81 | 43.26 | +1.05 | 27.37 |
| Mortgage Lifter | ..... | ..... | ..... | ..... | ..... | ..... | 46.87 | 39.06 | 38.67 | 56.56 | 45.29 | +2.46 | 29.56 |
| New No. 6 | ..... | ..... | ..... | ..... | ..... | ..... | 43.28 | 41.87 | 36.25 | 51.25 | 43.16 | — .28 | 27.81 |
| No. 7 | ..... | ..... | ..... | ..... | ..... | ..... | 46.25 | 36.56 | 33.20 | 74.06 | 47.52 | — .21 | 26.12 |
| Snure | ..... | ..... | ..... | ..... | ..... | 43.75 | 43.43 | 40.62 | 39.68 | ..... | 41.87 | — .61 | 27.94 |
| Tyration | ..... | ..... | ..... | ..... | ..... | 43.28 | 49.06 | 48.75 | 49.37 | 60.47 | 50.18 | +2.45 | 31.35 |
| Monarch | ..... | 35.00 | 41.14 | 42.60 | 51.14 | 42.08 | 49.87 | 35.71 | 37.74 | 55.43 | 43.41 | ..... | 30.03 |

It is not enough to know that a variety has given a yield of so many bushels per acre for a period of years, for more or less differences in soil are bound to be met with in ten acres of plot work. The increase or decrease, as shown in column 12, furnishes a surer guide to the best yielding varieties. Compared in this way we find, in the Welcome group, that the following four varieties have averaged more than three bushels and less than five bushels per acre more than the standard: American Banner, Improved American, Colonel and Clydesdale. The following five varieties have averaged more than one and less than three bushels per acre more than the standard: White Belgian, Centennial, Lincoln, Henderson's Clydesdale and Badger Queen; while Barley Oats and White Bonanza have exceeded the standard by less than one bushel. Next in order are the Bonanza King and Pride of America, which are less than one bushel below the standard; followed by White Victoria and Early Archangel, from one to two bushels below the standard, and Danish Island, White Wonder, Hargett's White, Race Horse and Silver Mine, from two to five bushels below.

Attention is called to the difference between the actual yield per acre and the increase or decrease as compared with the standard—the ten-year average in both instances. Judged by the yield, Bonanza King, Lincoln, Colonel and White Belgian head the list. Measured by the more accurate yardstick of increase above a common standard, we find the American Banner, Improved American, Colonel and Clydesdale at the head.

In the Wideawake group we find about the same variation that there is in the Welcome group, running from 4.74 bushels above, to 2.67 bushels below the standard. The best yielding sorts of this group are Kansas Hybrid, Bolton, Green Mountain and White California. At the other end of the list are Potato Oats, Early Siberian, Great Northern and Hopetown.

In the Seizure group we find seven varieties running from .28 bushels to 5.54 bushels above the standard, and five varieties below, ranging from 1.15 to 2.50 bushels. The White Swiss variety leading and the Black Tartarian bringing up the rear.

In the mixed group we find about the same variation as in the preceding groups, with the exception of the Early Ripe variety, which is by far the poorest yielder in the entire list, being over 17 bushels below the standard.

In comparing varieties of one group with varieties in another group it should be borne in mind that the duplicate plots of the Welcome variety, the standard of the Welcome group, average 3.27

bushels per acre more than the duplicate plots of the Widewake variety, 2.38 bushels more than the Seizure plots and 6.92 bushels more than the Monarch plots.

In comparing the four groups it will be noted that of the 21 varieties in the Welcome group, 17 average for the 10-year period over fifty bushels per acre, and only 4 varieties are below fifty.

In the Widewake group 8 varieties average over fifty bushels, while 15 varieties fall below.

In the Seizure group 5 varieties exceed fifty bushels, while 8 varieties are below.

In the mixed group 3 varieties are above 50 bushels and 11 below. It will be remembered that the newer varieties are found in the mixed group.

In Table I, column 13, is given the weight of each variety per measured bushel before recleaning. Only 9 varieties of the 71 average 32 lbs or above, per bushel. Of these 9 varieties all which are above 33 lbs. in weight are below the standard by which they are compared in yield per acre.

In Bulletin 101 the tendency toward a lower weight per bushel was noted. The four years since the issue of that bulletin give additional evidence of this tendency. Comparing the six years, 1893–1898, with the ten years, 1893–1902, we find:

For the six years, 1893-1898 there were:—

10 varieties of the 21 in the Welcome group,
2 " " " 25 " " Wideawake group,
6 " " " 13 " " Seizure group,

which averaged above 32 lbs. weight per bushel.

For the ten years, 1893-1902, there are:—

5 varieties of the 21 in the Welcome group,
0 " " " 23 " " Widewake group,
4 " " " 13 " " Seizure group,

which average above 32 lbs per bushel.

In this connection it is well to note that while there has been a decrease in weight per measured bushel, the weight produced per acre—the yield—has increased.

For the six years, 1893-1898:—

5 varieties of the 17 in the Welcome group averaged over 50 bus. per acre.
2 " " " 19 " " Wideawake group " " 50 " " "
0 " " " 11 " " Seizure group " " 50 " " "

For the ten years, 1893-1902:—

17 varieties of the 21 in the Welcome group average over 50 bus. per acre.
8 " " " 23 " " Wideawake group " " " " " "
5 " " " 13 " " Seizure group " " " " " "

This seems to indicate that an improvement in one direction has been at the expense of another desirable quality.

The average weight per bushel of the Welcome group for the ten years is 31.01 lbs; of the Wideawake group, 29.14 lbs; of the Seizure group 30.22 lbs; of the Mixed group 28.45 lbs.

In Table II is given the average length of season from seeding until harvest, or until oats were ready for harvest, the color of grain, the comparative strength of straw, and the pounds of straw per bushel of grain.

With the exception of one variety, the Early Ripe, found in the mixed group, the length of season lies between 98 and 105 days. There are only 5 varieties that have called for more than 103 days. The varieties which have given the largest yields lie between 99 and 101 days, with only one or two exceptions. The average length of season required for the different groups is as follows:—

Welcome, 99.6 days; Wideawake, 100.6 days; Seizure, 102.1 days; Mixed group, 98.8 days. The average for the 71 varieties being 100.25 days.

The column headed "Strength of straw" is compiled from notes taken at harvest time, season after season. It is intended simply as a comparison between the different varieties. The longer the season the stronger the straw, holds good with most varieties.

In column 4 of Table II is given the average number of pounds of straw per bushel of grain for the ten-year period. In the Welcome group the weight of straw exceeds the weight of grain in the case of each variety, as also it does in the Seizure group. In the Widewake group there are 9 varieties (including the seven heaviest yielders) with which the weight of grain exceeds the weight of straw.

### PREPARATION OF SEED BED.

Experiments were make previous to 1899 to compare plowing, or deep working of stubble ground, with disking or surface preparation of seed bed.

Ground was plowed 6 to 7 inches and fitted thoroughly, while corresponding plots were disked 3 to 4 inches and fitted. Combining the work of six years, including thirty different plots, the results show that plowing, with subsequent preparation of ground, has averaged 52.8 bushels per acre, while disking and the shallower fitting of the surface has averaged 48.7 bushels. A gain of 4.1 bushels in favor of plowing.

## OATS TABLE II—VARIETIES COMPARED.

Length of season; color of grain; strength of straw; pounds of straw per bushel of grain.

| VARIETY | Average length of season | Color of grain | Strength of straw | Pounds of straw per bu. grain |
|---|---|---|---|---|
| **WELCOME GROUP** | | | | |
| American Banner | 100 | White | Strong | 35.93 |
| Badger Queen | 100 | " | Medium | 33.63 |
| Barley | 99 | " | Weak | 37.80 |
| Bonanza King | 102 | " | Medium | 33 51 |
| Centennial | 99 | " | " | 36.32 |
| Colonel | 99 | " | " | 35.57 |
| Clydesdale | 99 | " | " | 37.14 |
| Danish Island | 104 | " | " | 33.98 |
| Early Archangel | 98 | " | Weak | 35.45 |
| Hargetts White | 98 | " | " | 38.68 |
| Henderson's Clydesdale | 99 | " | Medium | 34.78 |
| Improved American | 101 | " | Strong | 34.68 |
| Lincoln | 100 | " | Medium | 34.04 |
| Pride of America | 101 | " | Strong | 35.10 |
| Race Horse | 98 | " | Medium | 36.19 |
| Silver Mine | 100 | " | " | 33.81 |
| White Belgian | 100 | " | Strong | 35,10 |
| White Bonanza | 99 | " | Medium | 34.61 |
| White Wonder | 98 | " | " | 35.14 |
| White Victoria | 99 | " | " | 35.92 |
| Welcome | 99 | " | " | 37.10 |
| **WIDEAWAKE GROUP** | | | | |
| Alabama | 100 | White | Weak | 31.81 |
| Banner | 100 | " | Medium | 31.20 |
| Bolton | 103 | " | " | 29.69 |
| Early Dakota | 99 | " | " | 33.03 |
| Early Prize Cluster | 99 | " | " | 32.59 |
| Early Siberian | 104 | " | " | 38.10 |
| Early White Maine | 100 | " | " | 35.62 |
| Green Mountain | 103 | " | Strong | 29,84 |
| Great American | 101 | " | Medium | 34.83 |
| Great Northern | 100 | " | " | 30.97 |
| Hopetown | 101 | " | Strong | 36.47 |
| Kansas Hybrid | 100 | " | Medium | 31.72 |
| Nameless Beauty | 103 | " | Weak | 33.41 |
| New Baltic | 100 | " | Medium | 28.46 |
| Poland | 100 | " | " | 33.44 |
| Potato Oats | 99 | " | Strong | 35.05 |
| Probsteier | 101 | " | Medium | 33,19 |
| State of North Dakota | 101 | " | " | 34.12 |
| Scottish Chief | 99 | " | " | 31.32 |
| White California | 100 | " | Strong | 30.56 |
| White Schoenen | 100 | " | " | 33.12 |
| Yankee Prolific | 101 | " | Medium | 38.27 |
| Wideawake | 100 | " | " | 33.25 |
| **SEIZURE GROUP** | | | | |
| Black Tartarian | 102 | Black | Weak | 39.68 |
| Dakota Gray | 102 | " | Strong | 40.09 |
| Excelsior | 101 | White | " | 37.49 |
| Early Swedish | 101 | " | " | 37.65 |
| Egyptian | 101 | " | " | 40.28 |
| Giant Yellow French | 103 | " | " | 39.15 |
| Heavy Weight | 104 | " | " | 40.04 |
| Japan | 102 | " | Strong | 37.88 |
| New Zealand | 105 | " | " | 38.46 |
| Prince Edward's Island | 102 | Black | " | 37.74 |
| White Swiss | 101 | White | " | 36.25 |
| Wilson's Prolific | 101 | " | Weak | 37.35 |
| Seizure | 103 | " | Strong | 40.28 |
| **MIXED GROUP** | | | | |
| Big Four | 98 | White | Strong | 28.47 |
| Black Beauty | 98 | Black | Medium | 31.34 |
| Black Gotham | 99 | " | Strong | 41.54 |
| Everett's Negro Black | 98 | " | Medium | 31.94 |
| Early Ripe | 87 | White | Weak | 46.84 |
| Heller | 105 | Black | Strong | 39.97 |
| Mexican Gray | 99 | " | Weak | 30.20 |
| Michigan Wonder | 101 | White | Strong | 36.02 |
| Mortgage Lifter | 101 | " | " | 33.46 |
| New No. 6 | 101 | " | " | 34.95 |
| No. 7 | 101 | " | Weak | 46.28 |
| Tyration | 100 | " | " | 32.95 |
| Snure | 98 | " | Strong | 32.08 |
| Monarch | 98 | Black | Weak | 29.37 |

### AMOUNT OF SEED PER ACRE.

The matter of thick and thin seeding has been tested quite thoroughly, extending back to the year 1888. In Bulletin 57, page 113, a report is made of tests conducted for four years at Columbus and one year at Wooster, the results of which show slightly larger yields from six pecks of seed per acre than from more or less seed. These tests were conducted on "the warm gravelly soils of the Olentangy bottoms," except the one season as noted.

Table III takes up the same line of inquiry, beginning with the year 1898 and continuing five years. Two standard varieties have been used, the Seizure and the Wideawake. The amount of seed per acre ranges from four to eleven pecks.

Taking into consideration the five-year average, the Seizure variety gives its highest yield of grain from eleven pecks, exceeding, however, the yield from nine pecks by less than one bushel. The weight per measured bushel is highest from the ten-peck seeding. The yield of straw is largest from five pecks.

With the Wideawake variety the highest yield of grain is from the ten-peck rate, the heaviest grain from nine pecks and the largest yield of straw from four pecks. This table seems to indicate that nine or ten pecks of seed is as satisfactory as more, and rather better than less than this amount. This for Wayne county and similar soils.

### CONDITION AND QUALITY OF SEED.

Experiments as to quality of seed began in 1896 and have been continued since that date. Comparisons have been made as between mixed, light, heavy and common seed; also old and new seed. For the "mixed" seed four distinct varieties have been mixed together. The Wideawake variety has been used in the light, heavy and common seed tests. These oats, taken as they came from the thresher, have been used for "common" seed. When run through the fanning mill at a high speed with all the air possible, those which blew over were used for "light" seed and those which ran through the machine for "heavy." The light seed has weighed about 26 pounds on the average, and the heavy from 32 to 34 pounds. Table IV gives the bushels of grain from the different kinds of seed for each year; the seven-year average yield, and the average weight per measured bushel of the oats harvested. The yield of straw and the pounds of straw per bushel of grain are also given.

## OATS TABLE III.—THICK AND THIN SEEDING.

### SEIZURE

| SEED per acre | Yield per acre 1898 Grain | Yield per acre 1898 Straw | Yield per acre 1899 Grain | Yield per acre 1899 Straw | Yield per acre 1900 Grain | Yield per acre 1900 Straw | Yield per acre 1901 Grain | Yield per acre 1901 Straw | Yield per acre 1902 Grain | Yield per acre 1902 Straw | Average Yield per acre Grain | Average Yield per acre Straw | Average weight per measured bushel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bushels | Pounds | Bushels | Pounds | Bushels | Pounds | Bushels | Pounds | Bushels | Pounds | | | |
| 4 pecks | 26.09 | 2030 | 22.18 | 1245 | 54.45 | 3312 | 21.79 | 1512 | 50.46 | 2830 | 34.99 | 2179 | 23.69 |
| 5 " | 32.49 | 2170 | 25.15 | 950 | 57.73 | 3252 | 27.65 | 1495 | 55.13 | 3127 | 39.63 | 2199 | 24.05 |
| 6 " | 36.32 | 2352 | 26.24 | 965 | 56.24 | 2970 | 25.15 | 1435 | 56.56 | 3035 | 40.10 | 2151 | 24.85 |
| 7 " | 38.27 | 2425 | 30.93 | 1030 | 48.98 | 2432 | 28.43 | 1360 | 57.34 | 3030 | 40.79 | 2055 | 25.07 |
| 8 " | 41.32 | 2418 | 32.49 | 1005 | 51.56 | 2500 | 31.24 | 1480 | 64.53 | 2940 | 44.23 | 2069 | 25.12 |
| 9 " | 45.22 | 2527 | 36.24 | 985 | 53.75 | 2705 | 35.93 | 1650 | 65.31 | 2785 | 47.29 | 2130 | 25.49 |
| 10 " | 44.29 | 2252 | 37.65 | 985 | 52.34 | 2475 | 34.99 | 1410 | 63.43 | 2765 | 46.54 | 1977 | 26.05 |
| 11 " | ..... | ..... | 39.84 | 1100 | 52.60 | 2442 | 36.71 | 1515 | 63.67 | 2637 | 48.20 | 1923 | 25.72 |

### WIDEAWAKE

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 pecks. | 36.87 | 2220 | 36.48 | 1307 | 47.73 | 2367 | 36.39 | 1666 | 54.13 | 2557 | 42.32 | 2023 | 28.62 |
| 5 " | 40.70 | 2102 | 37.73 | 1387 | 48.95 | 2277 | 40.14 | 1826 | 60.62 | 2465 | 45.63 | 2011 | 29.37 |
| 6 " | 37.18 | 1800 | 38.51 | 1227 | 49.84 | 2040 | 38.11 | 1791 | 60.85 | 2622 | 44.89 | 1896 | 28.59 |
| 7 " | 42.96 | 2095 | 43.76 | 1402 | 48.89 | 2110 | 40.15 | 1736 | 59.29 | 2417 | 47.01 | 1952 | 29.43 |
| 8 " | 39.53 | 1875 | 43.90 | 1365 | 50.47 | 1960 | 40.61 | 1411 | 59.60 | 2477 | 46.82 | 1817 | 29.65 |
| 9 " | 37.18 | 1905 | 43.12 | 1400 | 53.28 | 2180 | 42.34 | 1686 | 60.78 | 2295 | 47.34 | 1893 | 29.71 |
| 10 " | 38.28 | 1950 | 44.13 | 1307 | 52.88 | 2207 | 41.94 | 1638 | 60.23 | 2362 | 47.49 | 1893 | 29.47 |
| 11 " | ..... | ..... | 32.03 | 1225 | 51.17 | 2082 | 44.37 | 1591 | 60.15 | 2440 | 46.93 | 1834 | 28.96 |

## OATS TABLE IV.—CONDITION AND QUALITY OF SEED.

| SEED | Yield of grain per acre. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1896 | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 7-year average | Weight per bushel Lbs. |
| Mixed seed | 27.80 | 54.68 | 41.87 | 34.99 | 43.12 | 36.56 | 70.43 | 44.19 | 29.09 |
| Light seed | 22.96 | 55.31 | 40.83 | 34.53 | 37.72 | 36.50 | 70.54 | 42.63 | 28.15 |
| Heavy seed | 28.28 | 57.18 | 48.82 | 36.40 | 41.40 | 39.62 | 72.50 | 46.31 | 28.43 |
| Common seed | 29.06 | 55.62 | 45.70 | 36.07 | 40.52 | 38.69 | 67.74 | 44.77 | 28.34 |
| *Old seed | ..... | 48.12 | 35.62 | 34.06 | ..... | 34.84 | 71.56 | 44.84 | 29.62 |
| *New seed | ..... | 54.37 | 42.50 | 33.44 | ..... | 35.15 | 73.04 | 47.70 | 29.35 |

| SEED | Yield of straw per acre. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1896 | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 7-year avearge | Pounds straw per bushel grain |
| Mixed seed | 960 | 1880 | 1970 | 1050 | 2020 | 1530 | 3020 | 1776 | 16 |
| Light seed | 905 | 1560 | 2207 | 1155 | 1878 | 1573 | 3237 | 1788 | 41.94 |
| Heavy seed | 1235 | 1590 | 2652 | 1155 | 1990 | 1726 | 2950 | 1899 | 41.01 |
| Common seed | 1280 | 1570 | 2067 | 1060 | 1853 | 1569 | 2983 | 1769 | 39.50 |
| *Old seed | ..... | 1010 | 2410 | 1070 | ..... | 1635 | 3120 | 1849 | 41.23 |
| *New seed | ..... | 1410 | 2140 | 1100 | ..... | 1525 | 3122 | 1859 | 38.98 |

* Variety of seed changed each year.

The heavy seed has produced an average yield of 3.68 bushels of grain and 111 pounds of straw per acre more than the light seed. The common seed has averaged 2.14 bushels more than the light and 1.54 bushels less than the heavy. The mixed seed 2.12 bushels less than the heavy and .58 bushels less than the common. There is little difference in the weight per measured bushel harvested from the different grades of seed. In comparing old and new seed, the variety used has been changed each year. "Old" seed means older by one year than the new. Taking the five-year average, new seed leads by 2.86 bushels. This indicates that choice old seed would better be used than poor, or unsatisfactory new seed.

### DEPTH OF SEEDING.

Experiments as to proper depth of seeding represent only two years' work. These results, given in Table V, are very interesting and this work will be taken up again. Indications are that it exercises as great an influence upon the yield as either the amount of seed per acre, or the quality of the seed. For both seasons drilling one inch in depth proved better than deeper drilling, exceeding two inches by 3.56 bushels, and three inches by 7.73 bushels per acre. The yield of straw was correspondingly greater by 463 pounds and 700 pounds per acre.

OATS TABLE V.—DEPTH OF SEEDING.

| DEPTH | Yield per acre | | Yield per acre | | Average yield per acre | | Straw per bushel of grain | Weight per measured bushel |
|---|---|---|---|---|---|---|---|---|
| | Grain | Straw | Grain | Straw | Grain | Straw | | |
| | 1897 | | 1898 | | | | | |
| | Bushels | Pounds | Bushels | Pounds | Bushels | Pounds | Pounds | Pounds |
| 1 inch.... | 58.90 | 1860 | 53.12 | 3450 | 56.01 | 2655 | 47.40 | 28.56 |
| 2 " .... | 56 15 | 1685 | 48.75 | 2700 | 52.45 | 2192 | 41.80 | 29.55 |
| 3 " .... | 52.50 | 1520 | 44.06 | 2390 | 48.28 | 1955 | 40.49 | 29.00 |
| 4 " .... | 54.06 | 1470 | 42.50 | 2080 | 48.28 | 1775 | 36.76 | 29.00 |

### DRILLING VS. BROADCASTING.

Table VI gives the results of experiments extending over the years 1897-1902. They show a slight increase in favor of broadcast seeding, viz. .68 of a bushel. I hardly think that we are to jump to the conclusion that broadcasting is better than drilling. Much depends upon the depth of drilling, as seen above. It is a quite common fault to drill oats too deep. Possibly, had the drilling been shallow in this experiment, results might have been somewhat different.

OATS TABLE VI.—DRILLING VS BROADCASTING.

| | Yield per acre | | Yield per acre | | Yield per acre | | Yield per acre | |
|---|---|---|---|---|---|---|---|---|
| | Grain | Straw | Grain | Straw | Grain | Straw | Grain | Straw |
| | 1897 | | 1898 | | 1899 | | 1900 | |
| | Bushels | Pounds | Bushels | Pounds | Bushels | Pounds | Bushels | Pounds |
| Drilling.. | 53.12 | 1440 | 39.22 | 1925 | 34.68 | 960 | 45.62 | 2040 |
| Broadcasting..... | 53.43 | 1690 | 44.06 | 2080 | 30.62 | 980 | 45.00 | 2080 |

| | Yield per acre | | Yield per acre | | Average yield per acre | | Straw per bushel grain | Weight per measured bushel |
|---|---|---|---|---|---|---|---|---|
| | Grain | Straw | Grain | Straw | Grain | Straw | | |
| | 1901 | | 1902 | | | | | |
| | Bushels | Pounds | Bushels | Pounds | Bushels | Pounds | Pounds | Pounds |
| Drilling.... | 35.92 | 1290 | 61.32 | 2687 | 44.98 | 1723 | 38.30 | 29.07 |
| Broadcasting..... | 38.12 | 1520 | 62.73 | 2817 | 45.66 | 1861 | 40.75 | 29.20 |

## SUMMARY.

These experiments show that varieties of the Welcome type of oats have given the largest average yield per acre and heaviest weight per measured bushel; American Banner, Improved American, Colonel and Clydesdale taking the lead.

On the somewhat sandy clay of the Station farm, plowing the ground for oats, as compared with merely disking it, has been justified by additional yield.

It has been more profitable to use 9 to 10 pecks of seed per acre than a smaller quantity.

It has paid abundantly to sow only the heaviest seed, as obtained by thorough screening.

Seeding not to exceed 1 inch in depth has brought larger yields than deeper seeding.

It has been better to broadcast the seed than to cover it 2 or 3 inches deep with the drill. Shallower drilling is strongly indicated.